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Indian Standard

GLOSSARY OF TERMS USED IN SYNTHETIC RESIN INDUSTRY

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Indian Standard

GLOSSARY OF TERMS USED IN SYNTHETIC RESIN INDUSTRY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 8 March 1972, after the draft finalized by the Raw Materials for Paint Industry Sectional Committee had been approved by the Chemical Division Council.

0.2 The resin industry is registering rapid development and the need for standardization of terminology for avoiding ambiguity and confusion in the usage of the terms was felt. The committee responsible for the preparation of this standard had felt that glossary of technical terms will help the processors, consumers and others connected with this trade in correct interpretation of the terms.

0.3 In the preparation of this standard considerable assistance has been derived from the following:

1970 Book of ASTM Standards : Part 20. Paint, varnish, lacquer, and related products — Materials specifications and tests; Naval stores; Aromatic hydrocarbons. American Society for Testing and Materials.

1970 Book of ASTM Standards : Part 21. Paint, varnish, lacquer and related products — Tests for formulated products and applied coatings; Building joint sealants. American Society for Testing and Materials.

Encyclopedia of polymer science and technology. 1966. Interscience Publishers, a division of John Wiley & Sons, Inc., New York.

0.4 Should any difference exist between the definitions in this standard and those in the standard for the individual materials, the later shall prevail.

1. SCOPE

1.1 This standard covers the terms and definitions that are prevalent in the synthetic resin industry.

2. TERMINOLOGY

A

Abietic Acid — The main acidic constituent of rosin, commercially known as resin acid.

Acid — Alkali Resistance — Resistance of coating system containing synthetic resin to the influence of acids or alkalis.

Acid Value — Number of milligrams of potassium hydroxide required to neutralize free acidity in one gram of resin.

Acrylic Resin — A polymer produced by addition polymerization involving monomers derived from acrylic acid (*see also* Resin).

Acrylated Alkyd — Alkyd modified with acrylic resins.

Adhesive Resin — A high molecular mass material compounded from products capable of strong adhesion for various applications (*see also* Resin).

After-Tack — The tackiness present in the film, after normal drying period.

Ageing — The storage of a synthetic resin either in the solid or liquid state or in solution under stated conditions in order to study the change in properties.

Alkyd Styrenated — *See* Styrenated Alkyd.

Alkyds — Polymers having a typically large molecular structure and are produced by reaction of polybasic acids with polyhydric alcohols and/or chemically interacted with natural or synthetic resins, fatty acids, oils, reactive chemicals, monomers, etc.

Amino Resins — A generic term used to denote the condensation resins made by the reaction of amines with aldehydes.

A-Stage — An early stage in the reaction of certain thermosetting resins in which the material is still soluble in certain liquids and fusible. Sometimes the product of this stage is also known as ‘ Resols ’.

B

Binder — Non-volatile portion of the vehicle of a resin solution which binds or cements the pigments, extenders and particles together and the film as a whole to the substrate.

Body — The apparent viscosity of a resin as assessed subjectively when applying an undefined shearing force, for instance, when pouring the material from a container, stirring it on brushing or otherwise spreading over a surface (*see* Consistency).

Bodied Oils — Vegetable oils, viscosities of which are higher than that at their natural stage.

Boiled Oils — Drying oils which are oxidised in presence of catalyst to enhance the drying property and are of normally higher viscosity.

Blown Oil — Drying oils which are polymerized at elevated temperature by blowing continuously oxygen in presence of catalyst and are relatively of higher viscosity than boiled oils.

Branched High Polymer — This polymer is one in which the long chain molecule is not uniformly straight like a pencil, but has branches extending from its trunk. The long chain molecule, despite these branches, remains unattached to other similar molecules surrounding it. (*see also* High Polymers).

B-Stage — An intermediate stage in the reaction of certain thermosetting resins in which the material swells when in contact with certain liquids and softens when heated, but may not entirely dissolve or fuse. The resin in an uncured thermosetting compound is usually in this stage. Sometimes the product of this stage is referred to as ' resitol '.

C

Colloid — A stage of subdivision of a substance, when dispersed in a liquid characterized by a particle size intermediate between molecular solution and dispersion and just visible by Tyndall effect.

Colour Retention — The resistance of resin or a coating therefrom to undergo any colour change during defined exposure conditions.

Colour Value — These are specified with reference to certain standard colour scales. For resins the colour value, number or index should be expressed in terms of:

Gardener colour scale,

Iodine colour scale, or

Rosin colour scale.

Colour value should be determined for 50 percent resin solution in specified solvent.

Comonomer — A monomer usually polymerized in presence of another monomer or comer.

Condensation — A chemical reaction in which two or more molecules combine with the separation of water or some other simple substance. If a polymer is formed, the process is known as polycondensation.

Consistency — The resistance of a non-newtonian material to deformation.

Copolymer — A long chain polymeric molecule comprised of at least two different monomers.

Cross Linking — The formation of three-dimensional network of bonds between similar or dissimilar liner polymers.

Cross Linked High Polymers — The polymers in which the long chain molecules, either straight or branched, have ladder rungs or cross-bridges binding them together. In the case of high polymer, all or most of the component long chain molecules are rigidly locked to each other laterally by primary linkages (*see also* High Polymers).

C-Stage — The final stage in the reaction of certain thermosetting resins in which the material is relatively insoluble and infusible. The resin in a fully cured thermoset is in this stage. Sometimes the product of this stage is referred to as ' resite ' (*see also* A-Stage and B-Stage).

Cure — To change the physical properties of a resin by chemical action which, for example, may be condensation, polymerization or addition usually accomplished by the action of either heat or catalyst or both, and with or without pressure.

Cure Time — The time taken to achieve the desired change in physical properties of resin or coating by chemical or physico-chemical action.

D

Degree of Polymerization (DP) — The average number of repeating units in a macromolecule.

Degradation — A condition in the polymer which detracts from its original characteristics, generally due to rupture of primary valence linkages or formation of unsaturated linkages or both.

Dehydrated Castor Oil (DCO) — Castor oil from which hydroxyl groups of fatty acids have been removed as water thereby introducing unsaturation in the chain.

Depolymerization — The process of breaking the polymer by thermal or chemical means to fragments.

Deterioration — A permanent change in the physical properties of a resin evidenced by impairment of these properties.

Diluent — A volatile non-solvent for a given resin used in conjunction with a true solvent to secure desired objectives in a coating composition.

Dilution Ratio — The capacity of an active solvent for a given resin to tolerate a non-solvent or blends of non-solvents used as diluents for economic considerations, as well as to secure desirable characteristics to the resin solutions. Dilution ratio is the ratio by volume of diluent to solvent in a mixture of solvent and diluent in such proportions that the mixture just fails to be a solvent for a given resin or polymer.

Dimer Acid — Generally liquid consisting of addition product of two units of a fatty acid.

Dispersion — A suspension of finely divided particles in another substance.

Driers — Substances, when incorporated in small proportions in convertible resin, accelerate the rate of drying when the composition is applied in the form of a film.

Drying — The process of change in the physico-chemical characteristics of the resin system to yield a film of desired characteristics (*see also* Drying Time). When the drying process takes place during exposure to air at normal temperature, it is called air drying; and if it is accelerated by the application of a moderate degree of heat (normally not exceeding 80°C), it is termed force-drying as distinct from stoving.

Drying Oil — Essentially a triglyceride of unsaturated fatty acids having iodine value above 150.

Drying Time — The time which elapses between the application of a coat of resin and the attainment of a specified dry stage (*see* Drying).

Durability — The degree to which resins and resinous materials withstand the destructive effect of the conditions to which they are subjected.

E

Elastomer (or Rubber) — Elastomer is a term that refers to non-crystalline high polymers or rubber that have a three-dimensional space-network structure (vulcanization) which imparts stability or resistance to plastic deformation. Normally, elastomers exhibit long range elasticity (rubber band effect) at ordinary room temperatures.

Emulsion — A suspension of extremely fine droplets of one liquid in another immiscible liquid.

Emulsion Polymerization — Two-phase polymerization of the free radical type in which organic monomers are emulsified in a liquid medium and wherein the initiators are soluble in a continuous phase and are capable of diffusing into emulsified monomer droplets.

Epoxide Equivalent — This is the mass of resin in grams which contains one gram chemical equivalent of epoxy. Epoxide equivalent is determined by reacting a known quantity of resin with a known quantity of hydrochloric acid and back titrating the remaining acid to determine its consumption.

Epoxy Resin — Reaction product generally of epichlorohydrin and bisphenol A. Certain special types of epoxy resins are produced by addition polymerization of monomers, namely, glycidyl acrylates (*see also* Resin).

Epoxy Esters — Fatty acid esters of epoxy resins.

Epoxy Value — This represents the fractional number of epoxy groups contained in 100 grams of resin.

Etherified (Alkoxylated) Amino Resin — Etherified reaction product of methylols of amino resins and alcohols.

F

False Body — The apparently full-bodied condition of a resin or its solution which undergoes a marked reduction in viscosity when agitated, and returns to its former condition either immediately or subsequently when allowed to remain at rest (*see also* Thixotropy).

Fatty Acid — An organic acid derived from vegetable oil.

Film — A film is relatively thin skin, membrance, or pellicle less than 0·25 mm thick which usually is transparent or translucent.

Flat (Matt) — The description of a coated surface film which scatters or absorbs the light falling on it, so as to be substantially free from gloss or sheen (*see also* Gloss).

Flash Point — The lowest temperature at which a combustible liquid will give off sufficient vapours that will burn momentarily.

Flexibility — The degree to which a coated film, after drying, is able to conform to movement or deformation of its supporting surface, without cracking or flaking.

Flexibilizer — An additive that makes a coating or rubber more flexible (also called as ‘ plasticizer ’).

Free Radical — An unsaturated electrically neutral molecular fragment formed by homolytic fission of a covalent bond in which the resulting unpaired electron takes no part in bonding.

Free Radical Polymerization — An addition polymerization induced by the presence or formation of free radicals due to a peroxideinitiator or light, radiation, etc (*see also* Polymerization).

Functionality — Number of active group available for polymerization.

G

Gas Checking — The development of wrinkles, often in a well-defined pattern in the surface of a resin system during drying. This condition results from the irreversible swelling of a partially dried surface skin, and may be aggravated by impure gas fumes during stoving in a gas oven in which case it is termed gas checking (*see also* Webbing).

Gel — It generally refers to a product which has a three-dimensional cross-linked network, not soluble in solvents, but swells, and is a system consisting of a network of solid aggregates in which liquid may be held.

Gelling — A specific term in usage indicating extent of reaction to a stage when the resin becomes unusable due to formation of a three-dimensional network.

Gel Time — The time required to convert a liquid composition into a gel under specified conditions.

Gloss — The degree to which a coated surface possesses the property of reflecting light in a mirror-like manner (specular reflection). The extent to which this property is developed depends mainly on the composition of the coated surface ranging from dead flat to full gloss being obtainable. The following stages in increasing order of gloss are normally recognized:

a) Flat (or matt) — practically free from sheen even when viewed from oblique angles,
b) Eggshell flat,
c) Eggshell gloss,
d) Semi-gloss, and
e) Full gloss — smooth and almost mirror-like surface when viewed from all angles.

Gum Resin — Resinous exudate distinguished by its solubility in water and charring on heating.

H

Hardness — It is a measure of resistance the cured resin film offers to deformation under stated condition. Generally it is expressed in seconds, using an oscillating technique for determining time, a film lasts without deformation.

Haze — Indefinite cloudy appearance within or on the surface of a resin or resin film.

Heat Resistance — The ability of the coating system to resist degradation by heat under specified conditions.

Heavy Bodied — Having a thick consistency or high viscosity. In case of resins or their solution, it is also associated with the ability to leave, after drying, a substantial coating (*see also* Body).

High Polymer — A macromolecule usually having molecular mass above 5 000 (*see also* Polymers).

Homopolymer — Polymers of which the molecule consists of only one type of structural unit repeated indefinitely (*see also* Polymer).

Hydrocarbon Resin — Resin derived from unsaturated hydrocarbons. Resins derived from petroleum sources are important subclass of this group and also known as ' petroleum resins ' (*see also* Resin).

I

Impact Resistance — The ability of a film derived from a resin system to resist a sudden blow (*see* Hardness).

Initiator — Generally a reactive that can give rise to a free radical polymerization.

Iodine Value — The number of grams of iodine absorbed per 100 g of the oil or the resin, which is the percent iodine absorbed. The iodine number or value of the oil or the resin gives an indication of the degree of unsaturation of the constituent fatty glyceride or the resin in its form of delivery. It is customary to give the method employed for its determination. Wijs method is applicable to all normal oils and fats not containing conjugated systems. For conjugated oils, Woburn's method is used.

Inhibitor — A substance when present in small percentage prevents or retards the rate of chemical reaction.

K

Ketone Resin — A product of reaction between a ketone and formaldehyde and/or other aldehydes (*see also* Resin).

M

Malamine Resin — *See* Amino Resins.

Monomer — The term is used both specifically and generically. Generically, it is a term applied to any of the various types of reactants, namely, true monomers, comers, etc, in the sense that they are the original reactants,

N

Natural Resin — *See* Resin, Natural.

Non-drying Oil — An oil which does not of itself possess to a perceptible degree the power to take up oxygen from air and lose its liquid characteristics.

Non-volatile Matter — The ingredients of a resin or coating composition which after drying, are left behind on the material to which it has been applied, and which constitute the dry film.

Non-yellowing — Resistance to the development of yellowing tinge during exposure for a period of time under stated conditions.

O

Oils (Fatty) — Triglyceride of fatty acid(s).

Oligomer — The chain consisting of only a few monomer units and a low molecular mass product.

Organosol — A suspension of a finely divided resin in a plasticizer, together with a volatile organic liquid.

P

Phenolic Resin — A generic term to denote a class of synthetic resins obtained by the reaction of phenol, alkyl and aryl phenols, with aldehydes, namely, formaldehyde, acetaldehyde, etc.

Plasticizer — A material incorporated in a resin to improve flexibility of a cured or a dried film (*see also* Flexibilizer). A plasticizer is generally regarded as non-reactive with the resin even in the cured stage.

Plastisol — A suspension of finely divided resin in plasticizer.

Polyamide Resin — A product of reaction generally between a diamine and a dibasic acid. Also a polymer derived by ring chain polymerization, for example, caprolactum (*see also* Resin).

Polyester — Polycondensation product of polybasic acid with polyol.

a) *Saturated* — Product of saturated polybasic acids with polyols.

b) *Unsaturated* — Product of unsaturated polybasic acids with polyols.

Polymer — A substance composed of molecules characterized by regular or irregular repetition (end, branch, functions, and other minor irregularities being neglected) of one or more types of chemical units.

Polymerization — A reaction in which related polyfunctional molecules combine to form a product of higher molecular mass without necessarily changing the primary chemical composition of the original constituents.

Polymerization, Emulsion — *See* Emulsion Polymerization.

Polymerization, Free Radical — *See* Free Radical Polymerization.

Polymerization, Solution — *See* Solution Polymerization.

Polyol — A chemical compound having two or more of hydroxyl groups bonded to carbon atoms in the molecule.

Polyurethane Resins — Synthetic resin obtained by the reaction of polyisocyanates with polyhydroxy compounds, such as polyesters, castor oil or glycols.

Pot Life — A maximum time for which a resin composition when prepared can be stored in usable conditions under specified conditions.

Precondensate — An intermediate stage in the process of condensation of suitable reactants which will permit of further reaction under stated conditions to achieve a practically useful resinous compound.

R

Reactive Diluent — A compound, usually a monoepoxide, when added to liquid epoxy resins reduces the initial viscosity of the resin system without impairing the desirable properties of the cured resin.

Residual Tack — Is defined as tack persisting in the resin film after complete evaporation of volatiles in the resin solutions.

Resin — Non-crystalline organic substance of varying molecular mass convertible or non-convertible type, having a softening range, possessing distinct clarity, normally soluble in organic solvents and having a characteristic to form a continuous film in a suitable form.

Resin, Acrylic — *See* Acrylic Resin.

Resin, Adhesive — *See* Adhesive Resin.

Resin, Amino, Etherified — *See* Etherified Amino Resin.

Resin, Epoxy — *See* Epoxy Resin.

Resin, Hydrocarbon — *See* Hydrocarbon Resin.

Resin, Ketone — *See* Ketone Resin.

Resin, Natural — Resin produced either in the metabolism of free growth or by insects. It also includes resins occurring in fossil form.

Resin, Phenolic — *See* Phenolic Resin.

Resin, Polyamide — *See* Polyamide Resin.

Resin, Sulphonamide — *See* Sulphonamide Resin.

Resin, Synthetic — *See* Synthetic Resin.

Resins, Amino — *See* Amino Resins.

Resins, Terpene — *See* Terpene Resins.

S

Saturated Fatty Acids — Principal component of non-drying oils characterized by carbon to carbon linkage without any ethylenic or methalinic group interspersed.

Saturated Polyester — *See* Polyester.

Segmar — The repeating or middle unit of the polymer.

Semi-Drying — Generally attributed to oils having iodine value or number in the range of 125 to 150.

Shelf Life — The period of time during which a packed resin or its solution may be stored under specified temperature condition and remains suitable for use.

Solid Contents — The residue left over after evaporation of the volatile matter without affecting any appreciable change in the physico-chemical characteristics of the resin, under stated conditions.

Solvent, Tolerance — The capacity of a resin in solution in a stated solvent to undergo dilution by a solvent without causing any precipitation or haziness or increase in viscosity. Solvent tolerance is generally stated as parts by volume or mass of the resin that can remain in solution in a stated solvent without undergoing any of the above stated changes.

Solution Polymerization — Polymerization in presence of a solvent where the polymer is in solution.

Softening Point — When the primary thermodynamic properties of a polymer are plotted against temperature, a change in the thermodynamic properties, such as volume or heat content, becomes apparent at some temperature. This is a discontinuity of the first derivative of the property. Hence this is considered a second order phase transition. This transition occurs at a characteristic temperature for all high polymeric materials and known as second order phase transition temperature or generally softening point.

Space-Network High Polymer — When there are two or more reactive functional groups in the monomer or mer building block, the growth of the polymer in three dimensions is possible during the course of the polymerization. Such a process gives rise to a space-network high polymer. A good illustration is the reaction between glycerol and phthalic anhydride, which yields a three-dimensional network polymer. Other examples are thermosetting resin, such as the phenol formaldehyde and the urea-formaldehyde (*see also* Polymer).

Stand Oil — Heat polymerized drying oils are known as stand oils.

Stereoregular High Polymer (Atactic Polymer) — When the R-groups or substituted groups are positioned on all sides of the main backbone of a long chain molecule in a completely random manner, an atactic polymer results. Such molecules can not pack tightly together because of steric hindrance and result in soft, non-crystalline and rather gummy products (*see also* Polymer).

Styrenated Alkyd — An oil-modified alkyd resin in which styrene has been already linked and does not exist as a monomer in the form in which the styrenated alkyd is delivered.

Sulphonamide Resin — These are condensation products of formaldehyde and aryl sulphonamides (*see* Resin).

Syndiotactic (or Syndyotactic) Polymer — When the R-groups or substituted groups occupy position that alternate regularly and in sequence above and below the main backbone of a long chain molecule, a syndiotactic polymer results.

Synthetic Resins — Resins obtained from low molecular mass compounds by condensation or polymerization.

T

Terpene Resins — Resins derived from terpene, based on α or β pinenes, etc (*see also* Resin).

Thermosetting — Having the property of becoming a thermoset on the application of sufficient heat (curing).

Thinners — Volatile liquids added to resins and varnishes to facilitate application and to aid penetration by lowering the viscosity. They should be completely miscrible with the resins or varnish at ordinary temperature and should not cause precipitation of the non-volatile portion either in the container or in the film during drying. For some purposes, thinners containing a small proportion of non-volatile material may be used.

Thixotrophy — Reduction in consistency of the material on the application of shear stress and the recovery of the original consistency when the stress is removed.

U

Undercure — A condition of the coating of film in the process of change in the physico-chemical characteristics which arises when insufficient time and/or temperature has been allowed for adequate development of film properties.

Unsaturated Polyester — *See* Polyester.

Urea-Formaldehyde Resin — *See* Amino Resins.

V

Vehicle — The liquid portion of coating composition in which the pigment is dispersed.

Viscosity — Internal resistance to flow possessed by a liquid at stated temperature.

Volatiles — The liquid portion of the composition which is capable of evaporation.

W

Webbing — Webbing is generally regarded as a paint defect but is made use of in some paint finishes to give a textured coating which obscures minor fault and indentions in the surface to be coated.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Conversion*
Force	newton	N	1 N = 1 kg.1 m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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